Numerical study of active particle in a low-viscosity medium: the three-dimensional dynamics taking into account translational and rotational inertia

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There are plenty of situations in which the well-known overdamped approximation active Brownian motion as a model of self-propelled particles is not applicable as it does not account for the rotational inertia, which it can partially prevent "memory loss" with increasing rotational diffusion. They include biofilaments driven by molecular motors, living and artificial microflyers and interfacial surfers, field-controlled and super fluid microswimmers, vibration-driven granular particles and autonomous mini-robots with sensorial delays, etc [1]. We provide numerical study using the active Langevin motion model, which extends active Brownian motion to the underdamped case, and takes into account both translational and rotational inertia and velocity fluctuations by numerically integrating the Langevin equations of motion. The random rotation of the particle caused by fluctuations of the tangential component of the momentum transmitted from the environmental particles is described using the appropriate stochastic differential equation [2].

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